

What is claimed is:

1. A solvent-free, flexographic printing ink which is solid at room temperature, the ink consisting essentially of:

5 (A) a pigment;

(B) a thermoplastic binder selected from the group consisting of an ethylene copolymer, a hydrocarbon resin, and a combination thereof ;

10 (C) a wax selected from the group consisting of a highly branched hydrocarbon wax, a polyethylene homopolymer wax, an oxidized polyethylene wax, an animal wax, a vegetable wax and combinations thereof;

(D) a solid linear alcohol at room temperature; and,

(E) a dispersing agent; and, optionally,

(F) a solid plasticizer;

15 wherein, the ink has a melting point of about 75°C or greater, and when heated to a temperature between about 90°C and about 135°C, forms a molten ink which has a viscosity between about 100 cps and about 1200 cps.

2. The ink of claim 1 wherein the molten ink has a viscosity between about 100 cps and about 700 cps.

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3. The ink of claim 1 wherein the thermoplastic binder is the ethylene copolymer.

25 4. The ink of claim 3 wherein the ethylene copolymer is selected from the group consisting of an ethylene - acrylic acid copolymer; an ethylene - vinyl acetate copolymer; and a combination thereof.

5. The ink of claim 4 wherein the ethylene copolymer is the ethylene - acrylic acid copolymer.

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6. The ink of claim 5 wherein the ethylene - acrylic acid copolymer has an

acid number of about 40 and about 120 and a Brookfield viscosity at 140°C of about 100 cps to about 1000 cps.

5 7. The ink of claim 6 wherein the ethylene - acrylic acid copolymer has an acid number of about 120 and a Brookfield viscosity at 140°C of about 650 cps.

8. The ink of claim 4 wherein the ethylene copolymer is the ethylene - vinyl acetate copolymer.

10 9. The ink of claim 8 wherein the ethylene - vinyl acetate copolymer contains between about 15 weight % to about 50 weight % of vinyl acetate.

15 10. The ink of claim 9 wherein the ethylene vinyl acetate copolymer contains about weight 40% of vinyl acetate and a Melt Index of about 52.

11. The ink of claim 1 wherein the wax is the highly branched hydrocarbon wax.

20 12. The ink of claim 11 wherein the highly branched hydrocarbon wax has a number average molecular weight (Mn) of about 520; a softening point of about 67°C; and a viscosity at 99°C of about 6 cps.

25 13. The ink of claim 1 wherein the wax is the polyethylene homopolymer wax.

30 14. The ink of claim 13 wherein the polyethylene homopolymer wax is polyethylene having a number average molecular weight (Mn) of about 1000 – 1200, a molecular weight distribution of about 1 to about 2 and a melting point of about 82°C to about 104°C.

15. The ink of claim 14 wherein the molecular weight distribution of 1.2 to

1.5.

16. The ink of claim 1 wherein the wax is the animal wax.

5 17. The ink of claim 16 wherein the animal wax is a spermaceti wax

18. The ink of claim 1 wherein the solid linear alcohol is a fully saturated, long-chain linear alcohol having a melting point of about 75°C or greater and a number-average molecular weight (Mn) of about 350 or greater.

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19. The ink of claim 18 wherein the linear alcohol has a Mn between about 350 and about 750; and a melting point between about 75°C and about 110°C.

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20. The ink of claim 18 wherein the linear alcohol has a Mn of about 550; a melting point of about 99°C; a hydroxyl number of about 83; and a viscosity at 149°C of about 5.5 cps.

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21. The ink of claim 1 wherein the dispersing agent is one or more solid or paste hyperdispersant(s).

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23. The ink of claim 22 wherein the solid plasticizer is dicyclohexylphthalate.

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24. A solvent-free, flexographic printing ink which is solid at room temperature, the ink comprising:

(A) a pigment;

(B) an ethylene - acrylic acid copolymer;

(C) a highly branched hydrocarbon wax;

(D) a solid linear alcohol at room temperature;

(E) one or more hyperdispersant(s); and,

(F) a dicyclohexylphthalate;

wherein, the ink has a melting point of about 75°C or greater, and when heated to a temperature between about 90°C and about 135°C, forms a molten ink which

5 has a viscosity between about 100 cps and about 1200 cps.

25. The ink of claim 24 wherein the molten ink has a viscosity between about 100 cps and about 700 cps.

10 26. A solvent-free, flexographic printing ink which is solid at room temperature, the ink comprising:

(A) a pigment;

(B) an ethylene – vinyl acetate copolymer;

(C) a polyethylene homopolymer wax;

15 (D) a solid linear alcohol at room temperature;

(E) one or more hyperdispersant(s); and,

(F) a dicyclohexylphthalate;

wherein, the ink has a melting point of about 75°C or greater, and when heated to a temperature between about 90°C and about 135°C, forms a molten ink which

20 has a viscosity between about 100 cps and about 1200 cps.

27. The ink of claim 26 wherein the molten ink has a viscosity between about 100 cps and about 700 cps.

25 28. A method of melt flexographic printing comprising:

(I) providing an ink which is solid at room temperature, the ink consisting essentially of:

(A) a pigment;

30 (B) a thermoplastic binder selected from the group consisting of an ethylene copolymer, a hydrocarbon resin, and a combination thereof;

(C) a wax selected from the group consisting of a highly branched

hydrocarbon wax, a polyethylene homopolymer wax, an oxidized polyethylene wax, an animal wax, a vegetable wax and combinations thereof;

(D) a solid linear alcohol at room temperature; and,

5 (E) a dispersing agent; and, optionally,

(F) a solid plasticizer;

(II) heating the ink to a temperature between about 90°C and about 135°C to form a molten ink which has a viscosity between about 100 cps and about 1200 cps;

10 (III) applying the molten ink to a heated anilox roller in operational contact with a surface of a heated flexographic printing plate; and

(IV) printing the applied molten ink onto a substrate.

29. The method of claim 28 wherein the molten ink has a viscosity between about 100 cps and about 700 cps.

15 30. The method of claim 28 wherein the substrate is heated prior to printing.

31. The method of claim 30 wherein the substrate is cooled after printing.

20 32. A method for preparing a flexographic printing ink for hot melt flexographic printing comprising:
(I) preparing a molten pigment dispersion from a component mixture in a mixer / grinder which is heated to a temperature above the melting point of the component mixture, wherein the component mixture consists essentially of:

(A) a pigment;

(B) a solid linear alcohol at room temperature; and,

(C) a dispersing agent; and, optionally,

(D) a solid plasticizer;

30 (II) preparing a molten varnish from a second component mixture in a second mixer which is heated to a temperature above the melting point of the second

component mixture, wherein the second component mixture consists essentially of:

(E) a thermoplastic binder selected from the group consisting of an ethylene copolymer, a hydrocarbon resin, and a combination thereof; and,

5 (F) a wax selected from the group consisting of a highly branched hydrocarbon wax, a polyethylene homopolymer wax, an oxidized polyethylene wax, an animal wax, a vegetable wax and combinations thereof; and

(III) adding the pigment dispersion to the molten varnish and mixing in the second
10 mixer to form a homogeneous molten ink which has a viscosity between about 100 cps and about 1200 cps at a temperature between about 90°C and about 135°C.

33. The method of claim 32 wherein the molten ink has a viscosity between
15 about 100 cps and about 700 cps.

34. The method of claim 32 wherein the homogeneous molten ink is cooled to room temperature to form a solid flexographic printing ink.

20 35. The method of claim 32 wherein the molten pigment dispersion is added to the molten varnish during step (III).

36. The method of claim 32 wherein the molten pigment dispersion is cooled to form a solid pigment dispersion at room temperature prior step (III).

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